
RedHorse Environmental, in association with Three Rivers Quest (3RQ) Research Partners, has developed a water quality monitoring education pilot program for schools in the Allegheny River watershed. Understanding the condition of our streams and rivers through water quality monitoring is important because these waters are often the main source of drinking water for many communities, and clean waters support diverse, healthy aquatic ecosystems.

The pilot program is designed to engage students from grades 5 through 12 in monitoring water quality within the Allegheny River Basin. The pilot program will involve a limited number of schools monitoring water quality in local streams. RedHorse Environmental will provide the necessary equipment, teacher training, and technical support. Teachers and students who participate in the project will collect logger data (conductivity and temperature) from their home stream, use that data in the classroom, and place that data into a database. That database is shared by numerous organizations currently monitoring water quality throughout the Allegheny, Monongahela, and Ohio Rivers and maintained by 3RQ since 2013. By participating in the pilot program teachers and their students can learn about water quality, water chemistry, chemistry as it relates to aquatic biology, water sampling, data analysis, data entry, and database management.

Shared data are currently being used by researchers in the 3RQ program at West Virginia University, Wheeling-Jesuit University, and Duquesne University to develop baseline information and characterize the overall health of local streams and rivers. While we will provide a basic framework for using the data, each participating teacher is free to use the data it collects as it best fits their current curriculum and/or afterschool programs. We strongly encourage teachers to find innovative ways to utilize the data in a broader STEM framework.

Program Specifics

Teachers and their schools that choose to participate in the pilot will be provided with the necessary equipment and training to begin water quality monitoring in a local stream. This will require an initial time investment from a lead teacher and our staff in the project set-up process detailed below. Once the initial set-up is complete and the data logger deployed, our involvement with the school becomes limited to helping with technical assistance and support. Participating teachers and schools retain the freedom to use the data they collect as they choose.

Program development and set up typically extends over several weeks and includes contact via phone, email, and in-school visits with Pilot Program Staff and is summarized below:

- **Initial meeting** between teacher(s) and Pilot Program Staff to discuss potential participation in the project at your school, identify resource person(s), project familiarization, and general feasibility.

- **Project Equipment:**
 - **The Pilot Program will provide** the following equipment to the participating teacher(s)/school:
 - HOBO® U24 Conductivity Logger (U24-001);
 - Data Transfer device (allows data transfer from logger to computer);
 - Data Management Software (to be installed on computer);
 - Logger housing and installation stake;

 - **The participating teacher/school provides** a suitable computer for transfer and management of logger data and a secure internet connection is required to access the database.

- **In-School Training:**
 - Pilot Program Staff will provide training to the participating teacher(s) relative to the following:
 - Hands on training in the use of the data logger, the logger software, and logger deployment;
 - 3RQ Database Familiarization and Set-Up including account acquisition and login protocol;
- **Water Quality Monitoring Location and Logger Installation:**
 - Pilot Program Staff will discuss potential monitoring sites with teacher(s) emphasizing feasibility and safety;
 - Pilot Program Staff will conduct site visit and assist in installation of logger.
- **Logger Data Collection and Management:**
 - Data collection from logger may occur at intervals most appropriate to the participating teacher(s) and existing stream conditions (i.e., monthly);
 - Collected data can be stored locally and then uploaded to 3RQ database;
- **Ongoing Project Support:** Pilot Program Staff are available for program support.

Using Your Data

Once the initial set-up is completed and you are collecting monitoring data, the school can incorporate the data into their classrooms, after-school programs/clubs, or other activities. We also encourage teachers and schools to look at collecting additional data or seeking other sources of data for their monitoring location. Many of these additional data types are relatable to the water quality monitoring data collected by students. Other data could include:

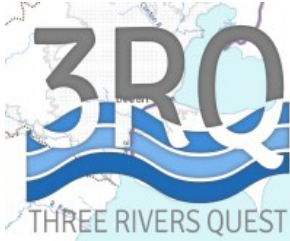
- water quality data from the US Environmental Protection Agency, US Geological Survey, PA Department of Environmental Resources, universities, or other non-profit organizations;
- additional water quality data collected on-site by teacher via meters or test kits;
- biological data (macroinvertebrate, mussels, fish) from Federal and State agencies, conservation organizations, universities, or collected on site by participating school;
- conduct habitat surveys of the monitoring location;
- general comparison of data with other sites via the 3RQ database;

Data Sharing

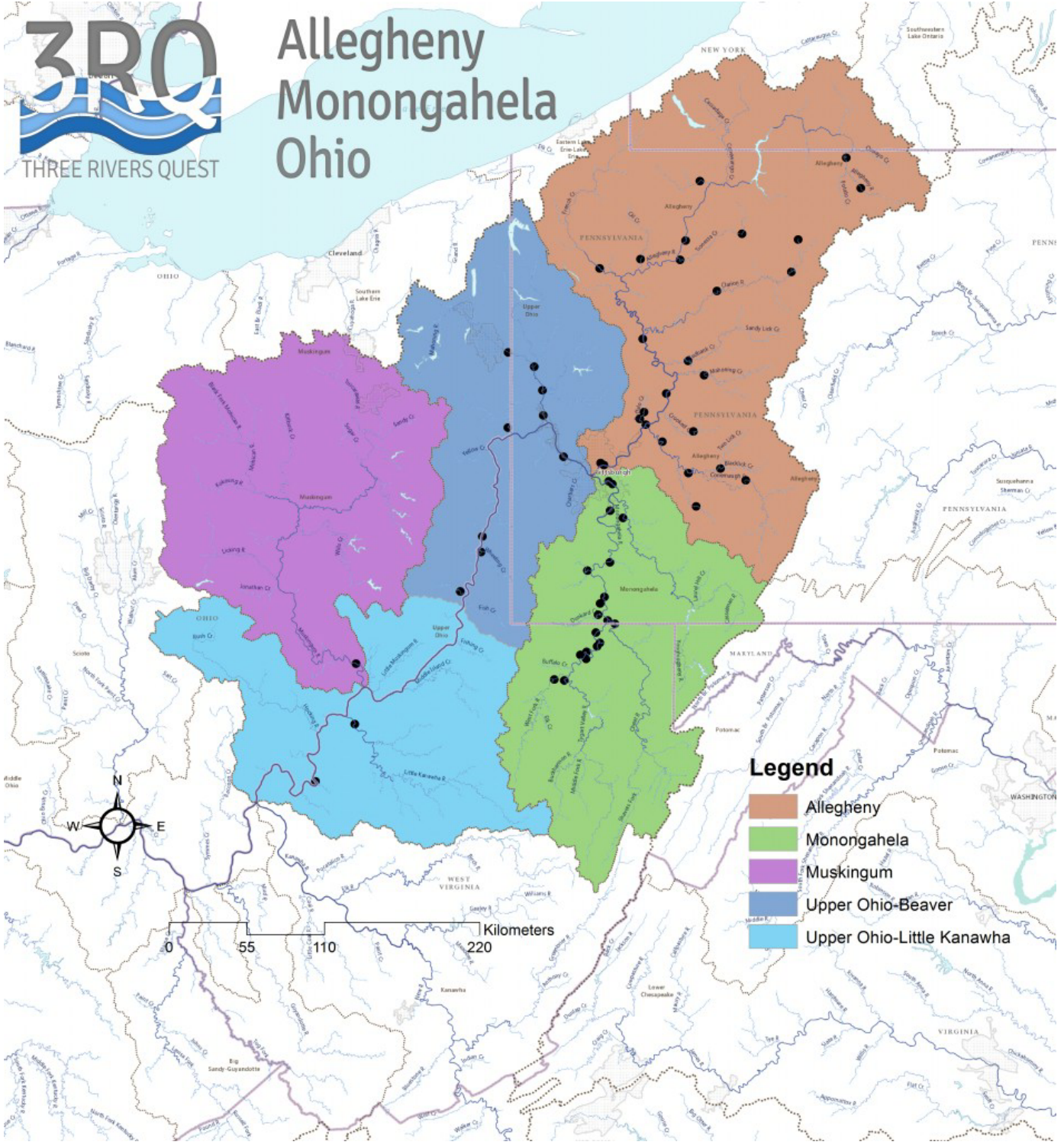
3RQ's Research Partners have full access to all data collected by all participants in the project. As part of their ongoing academic research we may analyze the data for publication as part of targeted research studies at a specific location or along a stream or river segment. The data collected by the 3RQ Research Partners is only shared among themselves. Publications by students is limited to school-based publications (e.g. school newsletters, symposiums, etc.).

Summary

The intent of this pilot project is to support schools and engage students in long-term water quality monitoring in streams where they live. By participating in the program and collecting data schools are actively developing data sets related to the health of the Allegheny River drainage system and their local streams. Schools have the flexibility to use the data as they see fit, with some possibilities being incorporation into current curricula, and/or afterschool programs. Equipment valued over \$1,000 is provided to the school at no cost. Training and ongoing support are also provided.



Allegheny Monongahela Ohio



Three Rivers Quest Monitoring Areas

Hobo Data Logger



Conductivity Range (low setting): 0 – 1,000 $\mu\text{S}/\text{cm}$

Accuracy: 2% 0 – 1,000 $\mu\text{S}/\text{cm}$

**Also records temperature & has full conductivity range @
0 – 10,000 $\mu\text{S}/\text{cm}$**

HOBO® U24 Conductivity Logger (U24-001) Manual



The HOBO U24 conductivity logger measures actual conductivity and temperature, and can provide specific conductance at 25°C with the HOBOWare® Conductivity Assistant. These easily deployable, rugged loggers provide the data you need for monitoring water purity and the impact of pollutants in fresh water. There is an optional U2X Protective Housing accessory (HOUSING-U2X) available to protect the logger and simplify mounting in harsh environments.

HOBO Conductivity Logger

U24-001

Included Item:

- Communications window protective cap

Required Items:

- Coupler (COUPLER2-C) with USB Optic Base Station (BASE-U-4) or HOBO Waterproof Shuttle (U-DTW-1)
- HOBOWare Pro 3.2 or later with the Conductivity Assistant 2.1 or later

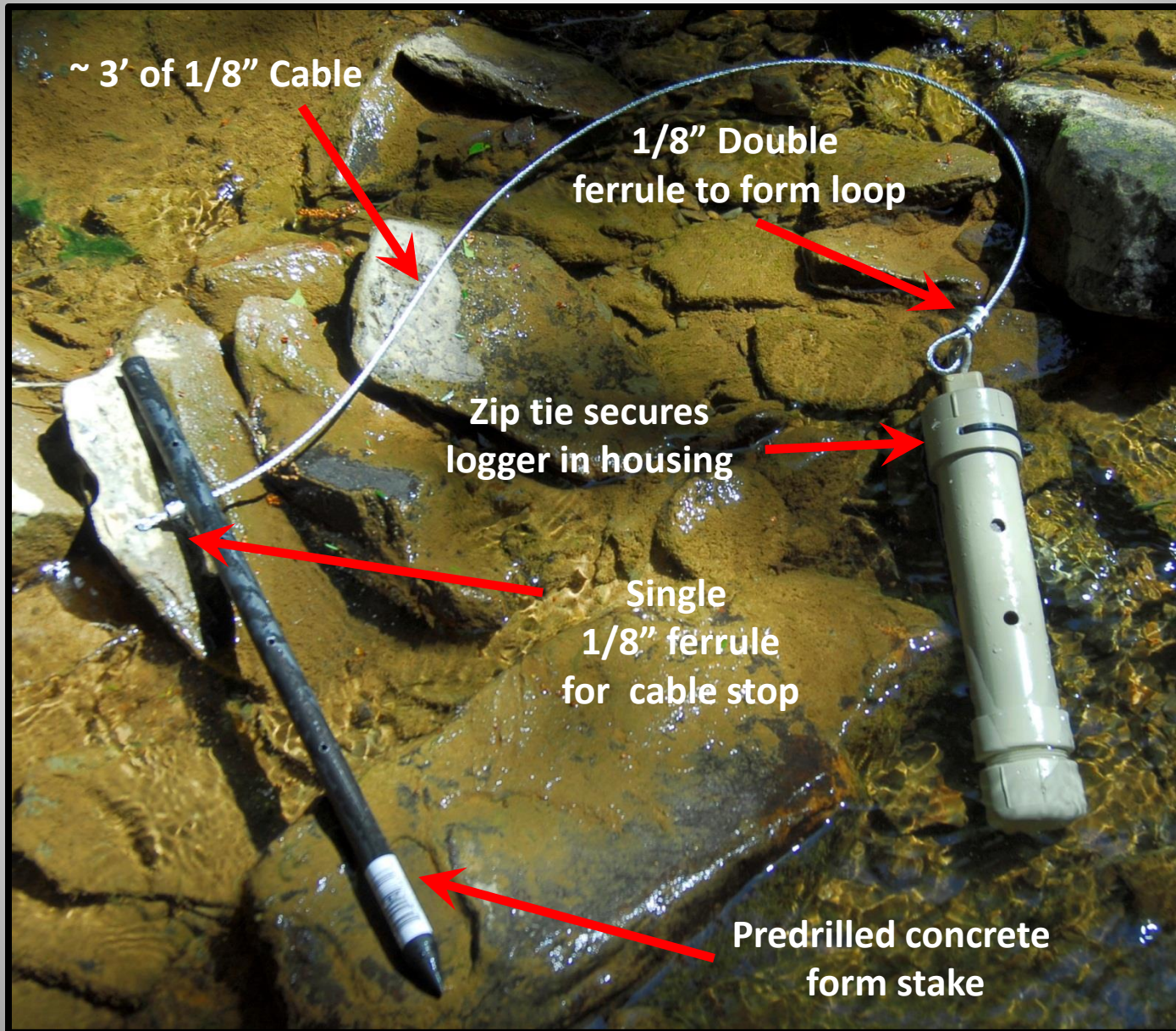
Accessories:

- U2X Protective Housing (HOUSING-U2X)
- Replacement communications window protective caps (U22-U24-CAP)

Specifications

Measurements	Actual Conductivity, Temperature, Specific Conductance at 25°C (calculated)
Conductivity Calibrated Measurement Ranges	Low Range: 0 to 1,000 µS/cm Full Range: 0 to 10,000 µS/cm
Conductivity Calibrated Range - Temperature Range	5° to 35°C (41° to 95°F)
Conductivity Extended Ranges	Low Range: 0 to 2,500 µS/cm Full Range: 0 to 15,000 µS/cm
Temperature Measurement Range	-2° to 36°C (28° to 97°F)
Specific Conductance Accuracy (in Calibrated Range)	Low Range: 3% of reading, or 5 µS/cm, and Full Range: 3% of reading, or 20 µS/cm, whichever is greater, using Conductivity Data Assistant and calibration measurements
Conductivity Resolution	1 µS/cm
Temperature Accuracy (in Calibrated Range)	0.1°C (0.2°F)
Temperature Resolution	0.01°C (0.02°F)
Conductivity Drift	Less than 3% sensor drift per year, exclusive of drift from fouling
Response Time	1 second to 90% of change (in water)
Operating Range	-2° to 36°C (28° to 97°F) - non-freezing
Memory	18,500 temperature and conductivity measurements when using one conductivity range; 14,400 sets of measurements when using both conductivity ranges (64 KB total memory)
Sample Rate	1 second to 18 hrs, fixed or multiple-rate sampling with up to 8 user-defined sampling intervals
Clock Accuracy	±1 minute per month
Battery	3.6 Volt lithium battery
Battery Life	3 years (at 1 minute logging)
Maximum Depth	70 m (225 ft)
Weight	193 g (6.82 oz), buoyancy in freshwater: -59.8 g (-2.11 oz)
Size	3.18 cm diameter x 16.5 cm, with 6.3 mm mounting hole (1.25 in. diameter x 6.5 in., 0.25 in. hole)
Wetted Housing Materials	Delrin®, epoxy, stainless steel retaining ring, polypropylene, Buna rubber O-ring, titanium pentoxide (inert coating over sensor)
CE	The CE Marking identifies this product as complying with all relevant directives in the European Union (EU).

Logger Ready for Deployment



Interpreting Specific Conductivity

